case study

Georgia:

How to build a state-wide telemedicine infrastructure

The Augusta-based Medical College of Georgia (MCG) houses the world's most comprehensive telemedicine initiative. The program goes well beyond videoconferencing. It integrates "video communication with remote controlled biomedical telemetry in order to provide a consulting physician with the ability to examine a patient at a satellite location as if the patient were in the physician's office."[1] Physicians review, transmit and mark up X-rays and other medical diagnostic records in real time. They examine patients through observation and dialog. Examinations are aided by standard medical equipment such as endoscopes and otoscopes equipped with specially adapted micro cameras.

Georgia's telemedicine program was founded by Dr. Francis Tedesco, president of MCG, in 1991. Dr. Jay Sanders, an internationally renowned telemedicine expert, was initially hired as a consultant and later recruited as its director.

Tedesco was motivated by the potential he saw for MCG to use telemedicine to improve medical services for Georgia's large rural population in a cost effective way.

Another objective is to encourage local physicians to remain in remote communities by electronically providing professional contact that they could not otherwise enjoy. It aims to reduce patient stress from travel to hospitals in larger centers. It is also designed to keep health expenditures and facilities within local communities.

Funded by the Bell South Foundation and MCG, a link was established in 1991 between MCG and Dodge County Hospital in Eastman, Georgia, 130 miles away. While this pilot evolved, the state government's Public Service Commission began considering how it would deal with a $73 million surplus which Bell South had been deemed to charge its customers, over and above its regulated authority, in 1991. Excited by the new developments at MCG, Governor Zell Miller championed a decision to allocate these funds to distance education and health care.

Governor Miller signed into law the Georgia Distance Learning and Telemedicine Act of 1992. This effectively launched the Georgia Statewide Academic and Medical System (GSAMS), the world's largest and most comprehensive distance education and health care network. Of the $50 million initial award, telemedicine received $8 million.

The money paid for installation of a T-1 infrastructure linking health facilities across the state, 50% of telephone line operating costs for the first two years and telemedicine equipment. The program is to be self-funding after two years. The state department of Administrative Services manages the GSAMS network in consultation with such partners as Southern Bell and local telephone companies.

Development and operation of the program has been carried out by the Telemedicine Center. Although the MCG subsidized the Center's operation initially, efforts have been made to obtain outside funding to offset program management costs.

In 1992-1994, medical specialists at MCG were linked to facilities in five rural sites. Additional funding support was secured from the state Department of Human Resources, which paid for links to three community health centers, and the Department of Corrections, which funded links to two prisons.

By late 1995, the network had been dramatically expanded. The configuration included over 60 sites – about 50 primary facilities, and 10 secondary centers (typically hospitals), each of which supports a number of primary sites. Two tertiary sites (MCG and Emory University in Atlanta) in turn support the secondary sites, and on occasion, the primary sites.

A telemedicine consultation is initiated by a local physician at a primary site. The local coordinator at the requesting site provides a local coordinator at the consulting site with patient records. They schedule the electronic consultation, which involves the patient, local physician, consulting physician and the coordinators.

The consulting physician typically directs a specialized examination by the local attending physician. The consulting physician talks to the patient and the local physician, observes the patient, using a zoom lens to concentrate on particular parts of the body, and reviews X-rays and other diagnostic tests. The consulting physician can see real time results of examinations using equipment such as a stethoscope, otoscope and opthalmoscope.

Insurers and funders such as Blue Cross and Medicaid reimburse both physicians as if this were a standard special consultation.

There have been surprisingly few concerns about the program. The main user concern - for better video quality - is being met by improving technology. The program has shown that it can achieve the benefits which were envisioned.

In-person and telemedicine assessments produce comparable results. Patients are pleased with the care they receive and the reduction of travel-related stress. Remote physicians say they have expanded their repertoire and skills; they can even obtain professional development credits in the process. Physicians in "supplier" centers are pleased to deliver good medicine, while expanding the variety of their practice and forging new relationships with local caregivers and institutions from other parts of the state.

Health expenditures and facilities stay within local communities. Costs to patients and insurers for travel and hospitalization in large centers have been cut. Although start up and infrastructure investments have been high, economies of scale result in low marginal costs for electronic consultations.

Specialists ranging from neurologists to cardiologists to psychiatrists have used the program. However, usage rates have been relatively low - on the order of one to two consults per day per site during the 1992-94 initial phase linking the first six centers.

Senior staff at the Telemedicine Center expect use to follow the typical innovation diffusion model and that the positive feedback of the early adopters will drive rapid growth among new users.

Now that most of the system is available across the state and the basic administrative infrastructure and protocols have been established, the Telemedicine Center is trying to increase usage through awareness building, education and marketing.

A specialized emergency medicine/trauma network and operation of pre-scheduled clinics are other priorities for 1996. Discussions are under way with funding agencies to enable practitioners other than physicians (e.g., nurses, social workers) to serve as the attending provider.

The Center is also involved in a number of related initiatives that promise to deepen the depth and breadth of telemedicine. They include:

- Prototyping an "electronic call" system to provide services to the home
- Establishing specialized networks for nursing homes, correctional institutions, military bases and other facilities that accommodate people with limited mobility
- Developing ways to transfer kinesthetic sensations, enabling the consulting physician to virtually palpate a patient
- Designing ways to integrate video communications and biomedical instrumentation with online medical databases and educational materials to support practitioner decision making, as well as patient health education and empowerment

BACKGROUND

Health in rural Georgia

The health sector faces the immense challenge of meeting escalating expectations for quality within increasingly severe fiscal restraints. This is especially true for much of southern Georgia, where even current levels of service are inadequate.

Northern Georgia and urban centers such as Atlanta and Augusta are well served by health facilities. But a high proportion of rural southern Georgia is low income (Figure 1a) and has limited access to medical specialists. In 1993, 11 of Georgia's 159 counties had no doctors at all. Less than 40% of the counties had pediatricians. 88% had no child psychiatrists (Figure 1b). African-Americans comprise a high proportion of many of these communities.

In many areas, private practitioners do not accept Medicaid or Medicare.

Sanders and Tedesco set out the implications for these communities:

Georgia counties with at least 20% of population below poverty level

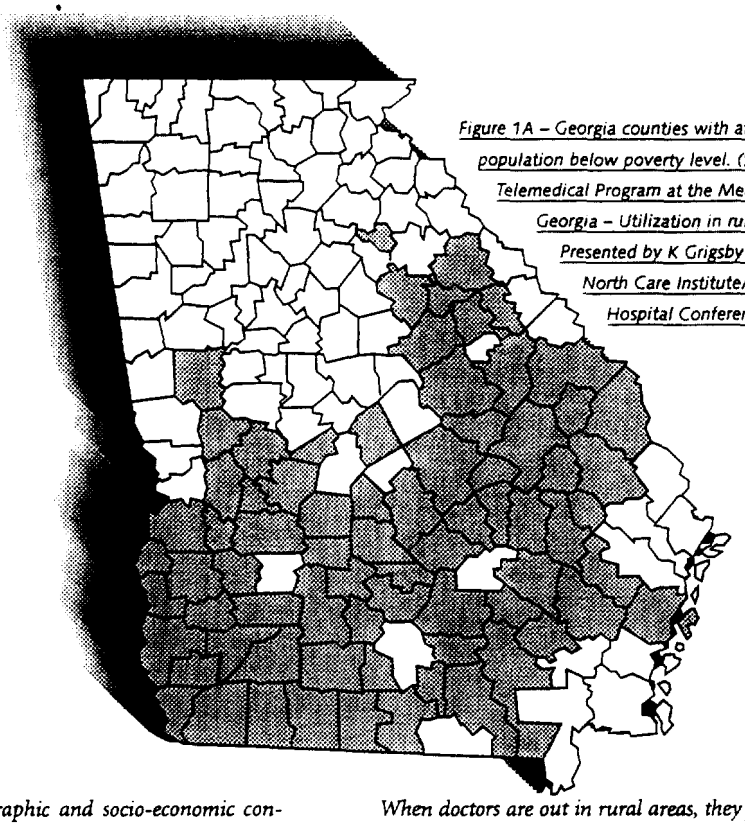

Figure 1A – Georgia counties with at least 20% of population below poverty level. (Source: The Telemedical Program at the Medical College of Georgia – Utilization in rural areas. Presented by K Grigsby at Michigan North Care Institute/MHA Smaller Hospital Conference)

As a result of geographic and socio-economic constraints, thousands of Georgians, disenfranchised from the health care system, are being denied basic medical services. Providing affordable, quality health care to patients where and when they need it has remained a frustratingly elusive goal. One of the major barriers to health care for patients in isolated or impoverished communities is the inadequate number of physicians who choose to establish or maintain their practice outside of a major metropolitan area. This resulting lack of physicians in Georgia's more isolated communities compromises both quality and continuity of care. Transportation costs also increase as patients must be transferred to distant hospitals. These transfers are deleterious not only to the patient but to the community as well. As a local hospital's bed census declines, its fiscal viability, along with the socio-economic fabric of the community, is threatened.[2]

Citizens of these communities who suffer complex medical problems must travel elsewhere if they are to receive services. Kevin Grigsby, research director at the Telemedicine Center, elaborates on the subtle but powerful interconnections linking rural isolation, physicians and individual and community health:

When doctors are out in rural areas, they feel professionally isolated. For a great part of the time they don't have access to specialty care. So what do you do? You send the patients off to Augusta or to Emory University in Atlanta. Or to Chattanooga, Jacksonville and Tallahassee, which are three of the largest metro areas serving our state – and they are not even in our state. Now, one of the big issues is that when you do that, the bed census at these little community hospitals drops, because you are sending people out for care. You get a lack of continuity of care and compromise the quality of care because most of the time people have to travel or wait. If you walk around Augusta, you will see the VA hospital next to the medical center. Motels are located all around because people are traveling here for care. Also, people with practices out there have a hard time with medical education. Because they can't keep up with state of the art, they have to close their practices. These are not group practices. This is typical of the rural US south and midwest.

Responding to need - 1991

Georgia's Telemedicine Center was founded in 1991 by Dr. Francis Tedesco. While teaching at the University of Miami he had been influenced by the thinking and writing of Dr. Jay Sanders, a Harvard-educated and internationally renowned telemedicine consultant. He recruited Sanders to be the Center's first director.

The Center is in an attractive brick house on the MCG campus, near the university library. Wood paneling evokes the traditions of a bygone era, while computers evoke the modern technology which enables this initiative.

MCG, one of the oldest medical colleges in the United States, is ranked by *US News and World Report* as one of the top 15 medical schools in the country.

The pilot's vision was "to assure that everyone in the state, whether living in the heart of Atlanta or on a south Georgia farm, has immediate access to quality medical care."[3]

Research conducted during the pilot showed that 86% of patients were treated effectively through a telemedicine consultation; they did not need to travel to a larger center to receive an in-person analysis.

Seizing opportunity - 1992

In 1992, an extraordinary opportunity presented itself. Southern Bell, the State's primary telecommunications provider, lost a class action suit for overcharging its customers. The $50 million award, instead of being distributed to individual telephone subscribers, was directed into a grant to implement the Distance Learning and Telemedicine Act of 1992.

The bill provided funding for an interactive, two-way T-1 network to deliver audio and video for distance learning and health care. $42 million was allocated for a distance learning network linking 185 public schools, colleges, technical institutions, universities and health care facilities. $8 million went to a telemedicine network and half the operating costs over two years.

Building the program - 1993-94

In 1993-94, the Telemedicine Center joined with the Department of Corrections to establish links to the Augusta Correctional and Medical Institute (ACMI) in Georgetown and the Men's Correctional Institute in Hardwick. The Corrections Department funded this initiative.

Responsible for community health centers, the state Department of Human Resources funded three additional sites. They were: Emanuel County Hospital in Swainsboro, Georgia; the Southeast Public Health Unit 2, District 9, in Waycross, serving a 16 county area; and the Tri-County Health Systems clinic, located in Warrenton and serving the surrounding four counties.

By the end of 1994, the Augusta Medical School of Georgia was serving six primary sites: Eastman, Georgetown, Hardwick, Swainsboro, Warrenton and Waycross. These included two rural hospitals, two correctional institutions, a public health facility and an ambulatory care center.

During this period, the Telemedicine Center also recruited a coordinator (Laura Adams) and a research director (Kevin Grigsby). The Center also has a local coordinator to manage the telemedicine consultations from the MCG site and several support staff.

Expanding state-wide - 1995

Originally, 16 additional primary sites and four secondary hubs were planned for a second phase. A third phase would expand the system to 59 sites and serve the entire state.

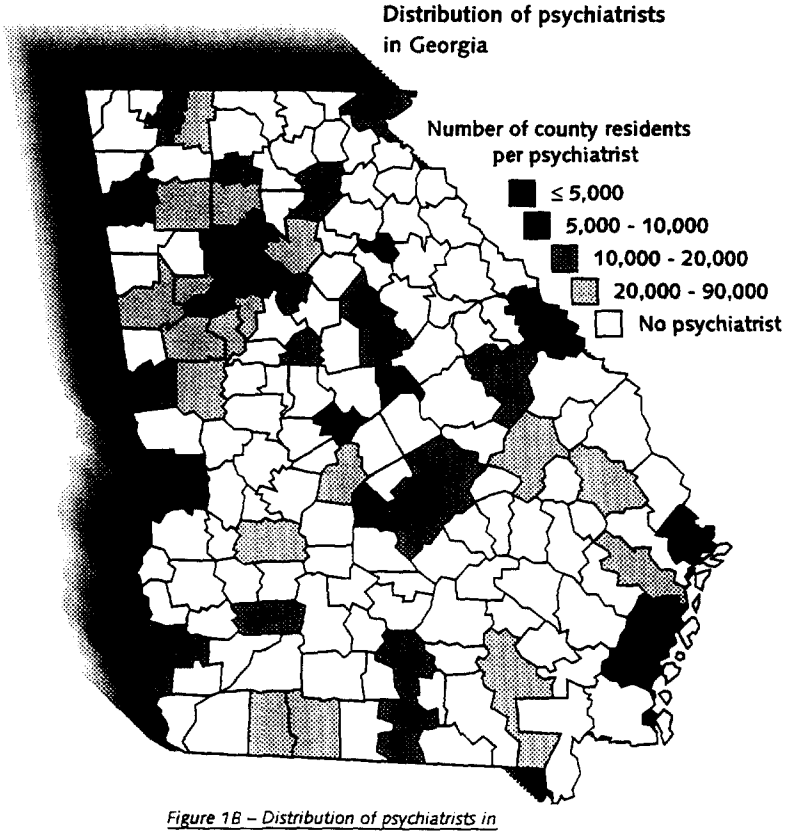

Figure 18 – Distribution of psychiatrists in Georgia. (Source: The Telemedical Program at the Medical College of Georgia – Utilization in rural areas. Presented by K Grigsby at Michigan North Care Institute/MHA Smaller Hospital Conference)

"I wanted to network the entire state to elevate the ability for patients to get a higher level of consultative care through their primary care giver without having to travel great distances."

Dr. Francis Tedesco,
president of the Medical College of Georgia

Based on the 1992-94 experience, it was decided to skip the second phase and move directly to a state-wide network. Primary sites would be selected on the basis of the need for access to outside specialists, and the presence of an interested health facility through which local physicians could participate. Secondary hub sites were expected to provide the medical expertise required to serve primary sites, be within a reasonable distance of these sites and have a good working relationship with them.

During early summer 1994, a site survey team traveled across the state to meet with health facilities which were interested in joining the network. Led by Adams, the Telemedicine Center director of operations, the team included representatives from the Georgia Department of Administrative Services, Southern Bell, the local telephone company, a technician from the contracted systems integrator and the local telemedicine coordinator. The team met with local health care providers to discuss the initiative.

One task was to choose the telemedicine room - typically square shaped and about 150 square feet. Equipment is arranged in a standard layout that affords ease of use to physician and patient. Details such as lighting, climate control and paint color are considered critical. As Adams indicates:

> *Our standardized process requires each room to be the same color for psychological, communication and clinical reasons. If you are in a remote facility and your walls are brown and you are looking at a monitor and the background is blue, you feel that distance. If your background walls are the same, that distance is eliminated. They also zeroed in on using the right kind of paint in order to reduce shadows and unnatural tones.*

Once a center is "qualified," a more intensive installation and training program follows.

By late 1995, the network now had 59 identified locations. These included 47 primary care facilities, 10 secondary centers (typically located at secondary level care hospitals) and two specialized tertiary centers. Primary sites typically connect to a regional hub. Army funds have been provided to add Eisenhower Army Medical Center (EAMC) in Augusta as a tertiary hub to serve the health needs of military personnel.

The first new MCG site, designed to provide rapid response support for medical emergencies, was established in 1991. It is adjacent to MCG's round-the-clock trauma centers. After the next equipment upgrade, physicians from all over the state will be able to access MCG's trauma specialists for emergency assistance 24 hours a day.

By September 1995, the seven existing sites had been joined by 33 new sites which had progressed through a three week process of installation, validation and training.

THE APPLICATION AND THE TECHNOLOGY

A 486 PC with 16 megabytes of memory and 2 gigabytes of disk is the basic computing platform. A CLI Rembrandt II/VP compression and decompression (codec) unit, especially suited to T-1 lines, provides full screen, full motion, high quality videoconferencing with fully synchronized and integrated audio. Each room has four cameras. The examination camera can zoom in on various parts of the patient's body and display medical images. The interview camera supports face-to-face discussion. A document camera enables sites to share written reports. A micro camera attaches to specialized biomedical examination tools (e.g., otoscope, microscope, opthalmoscope and endoscope).

Initial video quality wasn't very good, but it has steadily improved with advances in compression technology. Dr.

Bashir Chaudhary, a pulmonologist at MCG, indicated that in some situations, visual quality is even better than in-person examinations, due to the magnification provided by the camera-equipped instruments.

Included in the standard set up are several biomedical devices, each connected to a single microcamera by cleverly designed adapters which permit remote viewing.

> *Camera adapters enhanced by remote-controlled optics provide the ophthalmologist a clear view of the retina of a patient who is miles away. An ear, nose and throat specialist can observe a laryngoscopic examination. A gastroenterologist can direct an endoscopic procedure. A radiologist can interpret X-ray findings, including MRIs, CAT scans and ultrasound. A pathologist, utilizing the telemicroscopic adapter, can examine a frozen section of bone marrow slide. A surgeon or gynecologist can guide a laparoscopic procedure.... High resolution cameras make it possible to zoom in and study in detail a rash or a wound, or even the inside of the mouth.*[4]

Specialists can examine X-rays of a diseased lung, or computerized tomography scans of a patient with a head injury on a high resolution monitor. Freeze frames can be extracted from video and transmitted as images. A drawing tablet enables participants in two locations to draw over representations of slides or X-rays to consult by picture and diagram in real time. Images can be saved as part of the patient's record, with or without annotation.

Sound is also used. An electronic stethoscope magnifies the beat of a heart or the sound of lungs inhaling and exhaling. Ultrasounds and echocardiograms can be sent in real time.

Thus, the consulting physician can see and hear everything the doctor at the remote location sees and hears.

Control is through an AMX touch panel. By touching the appropriate icon, the user can select and fully operate any camera at either site.

A standard patient database contains images, sounds (e.g., heart and lung sounds), general patient information, and care giver notes.

Telecommunications network

To meet physician demand for high quality video, a T-1 infrastructure has been deployed between each primary site and its secondary site. Secondary and tertiary sites are connected by a T-1 "loop."

Currently, the T-1 loop supports only one connection at a time. Efforts are underway to improve switching and other technologies to permit several simultaneous calls involving secondary and tertiary sites. The T-1 loop connects telemedicine sites in different LATAs (local access transport areas). There are five LATAs in the state of Georgia. The inter-LATA piece of GSAMS (see below) was initially installed as a loop to keep line costs to a minimum. As with a long distance phone from one LATA boundary to another, there are charges and connection restrictions. As usage increases, additional inter-LATA lines will be installed.

The telemedicine network is part of GSAMS, the Georgia Statewide Academic and Medical System. GSAMS connects the telemedicine sites to over 300 schools, colleges and universities. Distance education uses half of the T-1 bandwidth, permitting up to eight sites to be connected at a time. Efforts are under way to increase this limit.

Figure 2 shows the sites and network connecting them.

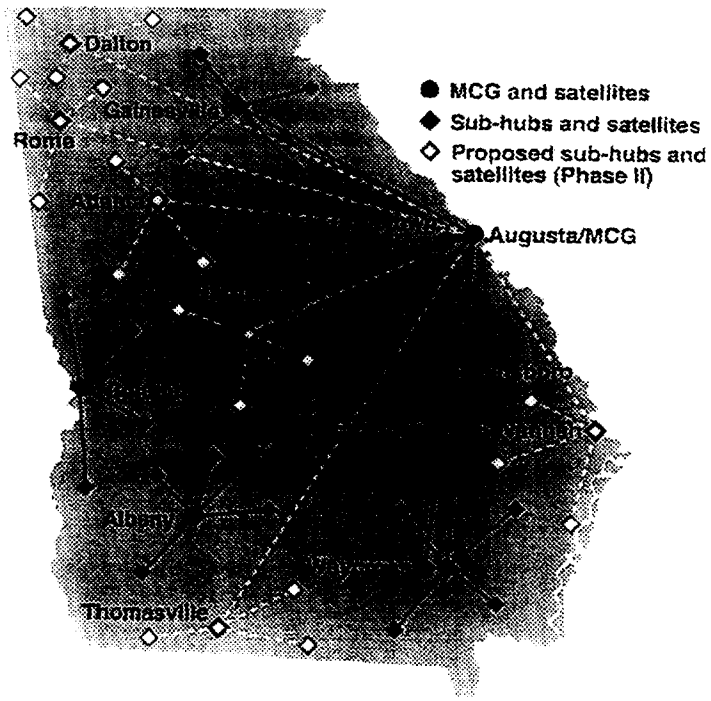

Figure 2 – Proposed Regionalized Telemedicine Health-Care Delivery System (Phase II) for Georgia (Source: Makan's provided by the Telemarketing Centre)

Consultation process

Steps of a typical telemedicine consultation are as follows:

1. A local physician decides on the need for a specialist.

2. The local coordinator or nurse contacts a secondary or tertiary site to request an appointment. Patient information and medical records are transmitted by fax.

3. A specialist reviews the file and determines whether video (vs. telephone or in-person) consultation is required and identifies the appropriate specialist.

4. The coordinator at the consulting site contacts the primary site coordinator to schedule the appointment. This is handled like an in-person appointment, although specialists tend to be more responsive than with other referrals (which typically result in a 1-3 month wait). The hub coordinator schedules the connection with the Flex-Serve Center.

5. Thirty minutes before the scheduled appointment, the two local coordinators check out the equipment. The remote coordinator greets the patient, and orients him/her to the telemedicine equipment. The patient is then introduced to the hub coordinator. This initial telemedicine communication helps ensure the patient is comfortable in the interactive environment.

6. At the commencement of the appointment, the requesting physician typically summarizes the key medical issues. The consulting physician greets the patient and may ask a number of questions. The coordinator at the consulting site pans, tilts or zooms the cameras to help the consulting physician obtain a clear and accurate view of the affected parts of the patient's body.

   The attending physician, under the direction of the consulting physician, examines the patient using the appropriate equipment (e.g., opthalmoscope, otoscope). The results are transmitted in real time to video monitors at the site of the consulting physician. Heart and lung sounds are also electronically transmitted in real time by the electronic stethoscope. The physicians examine test, slide or X-ray results.

   Information and ideas are exchanged. They may use the drawing tablet or mouse to highlight parts of these results. The consulting specialist points out relevant items to the requesting physician and patient.

   At the conclusion of the examination, the patient may or may not be excused. The specialist summarizes the findings and follows up with a consultation report. About 86% of the time, appropriate care is rendered without the need for a referral to a specialist in a regional center.

   The consultation is recorded on an S-VHS player. Both sites record audio, while the hub site records the remote video. The videotapes are part of the medical record.

RESULTS

Quality

A 1992 survey of 29 Dodge County physicians who had used the telemedicine system received 27 responses. Most had used the system only once.

78% indicated that the experience was satisfactory or highly satisfactory. 85% felt that telemedicine could improve care in rural hospitals. 56% felt that the telemedicine consultations require the same or less time than an in-person consultation. An obvious limitation of telemedicine - the inability to palpate the patient - was not perceived as a serious problem by 70% of the physicians.[5]

A recent study shows 100% correspondence between telemedicine and in-person identification of lesions.[6]

Local community physicians believe the system has enhanced the quality of health care. The experience of Dr. John Glenn Jr., a physician in Dodge County, is recounted below.

> *One of his first patients in Eastman was a young woman in her 20s with vague symptoms of a traveling weakness. She'd been to doctors in Savannah, Dublin and Macon and ended up back in Eastman still looking for a diagnosis. Multiple sclerosis came to mind; he opted for a telemedicine consult with neurologists at MCG and ultimately the beliefs were confirmed. "If it had not been for telemedicine, she probably would have done nothing further until she had really become symptomatic."*[7]

Dr. James Tison, a Dodge County physician, acknowledged that his initial reaction to telemedicine was skeptical. Today, he says telemedicine has improved his ability to handle complex issues such as cardiac dysfunction, endocrine problems, electrolyte imbalances, dermatological and rheumatalogical problems. He uses the system about once a week.

"Health care suffers when it's isolated, when it's out of the mainstream of new knowledge, when it doesn't have access to special expertise when you need it. This is the information and electronic age yielding benefits for health care. In a few years, everybody will be doing telemedicine."

Dr. Darrel G. Kirch, dean of the Medical College of Georgia School of Medicine

Similar confidence was expressed by three MCG specialists who consult to remote community physicians - Dr. Paul Webster (Professor of Gastroenterology and Hepatology), Dr. Joseph Bailey (Charbonnier Professor and Chief, Rheumatology) and Dr. Bashir Chaudhary (Professor of Pulmonology and Director, Georgia Sleep Center).

They and other physicians, however, have identified some limitations of the current system:

- Sometimes it is necessary to touch the patient to identify tumors or abnormal body conditions that cannot be visualized
- Patients are not comfortable discussing certain health problems (such as sexual dysfunction and initial diagnosis of cancer) in the presence of another doctor and two coordinators. Physicians are being trained to operate the equipment on their own, eliminating the presence of the coordinators.
- Physicians are accustomed to "multi-tasking" in their own offices. But they must leave their private offices to attend a telemedicine session. They often need to wait for a few minutes while the system connection is being setup. This travel and waiting time is a minor irritant in the busy schedules of specialist physicians.

Patient stress and satisfaction

In the past, patients with complex medical problems were typically referred to a big city hospital. This meant lost work time, travel costs and dealing with unfamiliar people and settings. Frequently, a second trip was required to obtain results. Barbara Bivins, the emergency department manager of Dodge County Hospital, describes the situation:

You have to remember the Dodge County census. We have more elderly people than we do younger people. So, whenever somebody is sick and they have to go to a consult in a different town, usually all the young people in the family have moved out. So who's taking Aunt Fanny to Augusta is somebody close to her own age. They go up one day for tests and they go back a couple of days later for results. This is not good for these older people.

Patient stress is also reduced because of the speed of feedback. Dr. Tison says,

A surgeon in a small hospital operating on a patient with a tumor would have to biopsy the area, then send the biopsy off for analysis to some distant location where there is a pathologist. The patient must wait, possibly several days, until the doctor learns the study results. If there is cancer, the patient likely must undergo another operation. With telemedicine that doctor could have scheduled an MCG pathologist to be on standby during the operation. And - just as it would happen at a hospital with pathologists - the biopsy would be taken, the pathologist would immediately examine the frozen section and a decision on whether further surgery was needed could be made right then. The patient and his family don't have to wait; the doctor doesn't have to wait.

Patients gain the satisfaction of knowing that additional expertise is being applied in a congenial and timely fashion.

Perhaps even more important is the friendliness and the free interaction telemedicine allows with the doctors talking to each other, the patient and a family member as well, if the patient likes. 'Patients feel assured that it wasn't just one doctor's opinion, that they get a second opinion and they didn't have to go anywhere.'

"While our skill at diagnosing and treating disease continues to improve, our ability to distribute and deliver that care has not. The challenge is to integrate our ability to treat with the delivery of that treatment. Alternative systems must be explored, and advances in telecommunication and information processing provide obvious tools to help structure those systems."

Dr. Jay Sanders, director of the Medical College of Georgia Telemedicine Program

While some patients are initially shy, others enjoy being "on camera." Nearly all are at ease by the second visit.

Physician education and relationships

Remote physicians are often isolated from their professional peers.

Telemedicine helps general rural practitioners obtain practical information and hands-on coaching. Dr. Tison says, "It's like going to a continuing education meeting, one-on-one with the professor, discussing a difficult problem." In fact, remote community physicians can obtain continuous medical training credits for participation in the telemedicine program.

Telemedicine has also fostered new relationships among physicians and institutions across the state.

Retaining local physicians and enhancing local facilities

It is difficult to attract and retain physicians in remote communities because of professional isolation, lack of continuing medical education, low patient volume and loss of continuity when patients are transferred to hospitals in larger centers.

Telemedicine helps solve all these problems. As a result, remote communities are better able to attract and retain generalist physicians. Dr. Tedesco points out how this reinforces US health policy:

"The government is saying we need more generalists, fewer specialists. Telemedicine allows you to have more generalists and for them to feel more comfortable because they can be hooked up with specialists, but remotely."[8]

Enhanced local health facilities is another benefit, according to the experience of Barbara Bivins.

'When Barbara Bivins heard she was getting some newfangled equipment in her already crowded emergency room, she told hospital administration she didn't have the time, space or interest. 'I just said No. I don't want it. Over my dead body. So they moved it in,' said Bivins, the emergency department manager of Dodge County Hospital in Eastman, Georgia.

Three years later the 'newfangled' has become a routine part of providing health care at this 92-bed south Georgia hospital and Mrs. Bivins its advocate. 'You need something every once in awhile to spark you up. I've been a nurse since 1966 and I think this is one of the greatest things I've seen in nursing in all the years I've been in it.'

"I've seen how it's helped the patient, how it's helped us, a rural hospital and community, because it generates revenue for us. The physicians in Augusta say 'I need such and such type of scan' and we can do that scan here, so Dodge County Hospital gets the revenue.'"[9]

Levels of use

In 1992-94, 360 consultations were conducted at the four original non-correctional sites. During this period, the original Dodge site was fully operational, while the others averaged one year of operations. Consultations were also carried out at the two correctional sites.

Specialties consulted are listed in Figure 3.[10]

Staff at the Center were pleasantly surprised about the variety of disciplines which were consulted. Adams notes:

...psychiatry and neurology were two specialties that we thought probably would not feel that they

were benefiting their patients through telemedicine. In fact they have found exactly the opposite. The type of system that we use, the sophistication that it has, the bandwidth we have access to is critical so that neurologists can see subtle shaking, movements or ticks, and psychiatrists can see expressions."

Nevertheless, usage levels are low. In 1994, the average use of a fully operational site was about 1.5 sessions per week.

Adams and Grigsby expect to see a standard diffusion of innovation curve, where a slow period of early adoption is followed by rapid growth. Grigsby says:

You have to consider the way people adopt innovation. Typically, what happens is that you don't have linear adoption. What happens is you have a group of people who start to use and as they start to tell other people, then you have acceleration. If you're not constantly reinforcing that information, they are not automatically thinking of telemedicine as a treatment option. There is a need for a paradigm shift. It's not in their consciousness yet.

The view is that a) the initiative has just moved out of the pilot/proof of concept, b) use levels are, in fact, increasing and c) the Center needs to do a better job of marketing/communication which, indeed, it has started to do.

Cost-benefit analysis

Benefits need to be compared with the incremental costs. Based on Georgia's experience, Figure 3 presents cost estimates for various scenarios.

Specialty	Number of consultations (Minimum = 10)
Cardiology	52
Neurology	38
Dermatology	36
Urology	24
Rheumatology	23
Psychiatry	23
Gastro-intestinal medicine	23
Neurosurgery	22
Metabolic/endocrine	19
Pulmonary	14

Figure 3 – Consultations 1992-94
(Source: Georgia Medical College)

The key conclusions derived from this analysis are:

- The average cost per call at recent use levels - approximately 1.5 calls per week per site - is $847 per session. At three calls per week, average cost per call is $444.
- At substantially higher use levels of two or five calls per working day, the cost drops to $161 and $88 respectively
- Variable costs are $40 per call. This includes part of the time spent by the two coordinators and session-related operating costs (e.g., a VCR tape). Bell South currently provides 74 hours per month for $1,500. At an average of 33 minutes per consultation, this covers approximately 1,620 calls per year – or more than five calls per working day. Marginal costs beyond this level of telephone use are approximately $8 per session.

In assessing the reasonableness of these costs, the following should be considered:

- Additional savings result from keeping a patient in a local hospital rather than a larger community or academic hospital. The cost per day at MCG is $1,841 vs. $1,098 at a community hospital. If telemedicine eliminates the need for patient travel 86% of the time, and that half of such travel involves hospitalization, average savings per call would be $319. (Savings at regional centers might be slightly less but still significantly more than the marginal cost per call for $40.)
- Telemedicine reduces travel and accommodation costs to patients and insurers
- Communities derive economic benefits from keeping local health facilities and physicians
- Timely diagnosis and treatment provided through telemedicine contributes to disease prevention, reducing health complications and hence, health care costs
- The current telemedicine implementation requires and reimburses both requesting and consulting physicians. Additionally, Medicaid provides a facility free of charge to the remote site. However, many of the services provided by the local physician could be delivered by lower-cost health professionals. Also, the roles of one or both coordinators could be reduced by training health professionals to use the equipment.

Category	Annual cost and assumption	Use scenarios			
Calls per week		1.5	3	10	25
Calls per year		78	156	520	1,300
Amortized cost of equipment and maintenance	Base - $20,000 - 20 year amortization of capital costs including initial $120,000 for equipment plus ongoing replacement, upgrades and warranties	$20,000	$20,000	$20,000	$20,000
Share of telemedicine center operations	Base - $10,000 - assume $600,000 of Center staff and related costs shared 60 facilities	$10,000	$10,000	$10,000	$10,000
2 local co-ordinators	Base - $10,000 (2X$5,000 -1/6 of $30,000 representing annual salary, benefits and office support) plus Variable - $30 (2X$15 per call)	$10,000 $2,340	$10,000 $4,680	$10,000 $15,600	$10,000 $39,000
Other operating costs	Base - $5,000 Variable - $10 per call	$5,000 $780	$5,000 $1,560	$5,000 $5,200	$5,000 $13,000
T-1 operating costs	Base - $18,000 ($1500/month covers 74 hours/month or 1,620 sessions per year at 33 minutes per session.) Variable - Additional costs are $15 per hour or about $8/session after 1,620 sessions. (These are somewhat lower than conventional commercial rates due to the arrangements struck with South Bell.)	$18,000 $624	$18,000 $1,248	$18,000 $4,160	$18,000 $10,400
Total cost		$66,120	$69,240	$83,800	$115,000
Average cost per call		$847	$444	$161	$88
Marginal cost per call[11]		$40	$40	$40	$40

Figure 4 – Estimated ongoing annual and per session costs of telemedicine under various use scenarios. (Source: Medical College of Georgia)

- Telemedicine services for correctional institutions provide the added advantage of reducing the risks associated with transporting prisoners
- In-patients also can be released from hospital sooner, if they can be followed up via telemedicine
- Procedures and tests typically repeated when a patient is transferred to another facility are also reduced or eliminated

ORGANIZATION

Governance and role of telemedicine center

The structure of the distance learning and telemedicine programs Governing Board reflects its funding roots. The State Senate bill established a committee to oversee the distance education and telemedicine programs. Members include the state's directors of education, planning and budgeting, and administrative services, as well as a representative of the Governor. The committee reports to the Governor.

An administrative subcommittee recommends programs, funding and site selection.

A telemedicine task force advises the administrative subcommittee. It includes the directors of the department of Administrative Services and representatives of the Medical Association of Georgia, the Georgia Hospital Association, MCG and the Governing Board.

MCG has been asked to manage the telemedicine program. The head of the Telemedicine Center, Dr. Jay Sanders, reports to the dean of medicine. The latter reports to the president of the university, Dr. Francis Tedesco, who is the Governor's appointee to the state committee.

The committee will disband when the funds have been spent. This is expected to happen sometime in 1996/97. At that time, a new structure will be required. Adams believes that consideration should be given to locating it in the Department of Health Care and Education.

Administrative and training support

Key to rapid startup of new sites and quality of service has been the Center's administrative and training capabilities.

A comprehensive 300 page manual sets out operational procedures including communication scheduling, and patient information protocols, along with a set of standard forms.

The local coordinator is responsible for: ensuring that the telemedicine facilities are in good working order; scheduling and arranging consultations; providing the consulting physician with background information on the patient; and operating the equipment during a session. In effect, the coordinators handle all matters other than those directly related to the practice of medicine. This frees physicians to concentrate on health rather than administrative matters.

Although the program emulates in-person medicine in many ways, the subtle differences mean that new skills are required. Physicians need to learn how to use adapted medical devices. They must learn to look into the camera and not the monitor to make direct eye contact. Physicians typically speak too loudly until they learn that the audio system transmits normal voice levels. They also need to learn to pose in ways that enable full body shots - not just head and shoulders.

In mid-1995, the Center took on the job of training physicians and residents on effective communication in a telemedicine environment. This initiative is being implemented through the Robert Wood Johnson program, a nation-wide program to support the placement of physicians in rural areas.

PLANS

The Center's short term goal is to enhance operations and use within the current infrastructure. Expansion depends on several exciting research and development thrusts which will take some time to bear fruit.

Improving operations within the current infrastructure

Both Adams and Grigsby are aware of telemedicine's potential. However, they are acutely focused on the need to consolidate, manage and improve current operations.

Adams says the focus must be on the *"here and now."* They feel it is too easy to be seduced by the future possibilities. "The future is here, and needs attention now."

The Center's plans to improve use of the current infrastructure are described in the following sections.

Enhance user awareness and involvement in program development

Now that the technology has been shown to work, administrative procedures established and a network of sites selected, the Center's focus will be on communication and awareness - in other words, marketing. Adams notes,

We have not marketed telemedicine to say this is what we can do. The adoption curve is rooted in the number of rural physicians who are exposed to this. We have not been effective at education and training and at reinforcing this with use. The learning curve is obviously very, very important. But the learning curve isn't going to move unless training and education are intrinsic to the program.

Because the critical customers are remote physicians - for it is they who initiate requests for service - communication strategies are addressed to this group. Approaches include:

- A quarterly state-wide newsletter
- Inclusion of telemedicine in medical training and resident programs
- Real and virtual conferences to showcase the technology and discuss clinical, operational, administrative and research components of telemedicine. The first was attended by 138 people July 21-22, 1995.
- Enhancing user engagement and commitment by involving participating health centers in two areas of program development. Strong interest has been expressed by many centers in electronic emergency services and clinics as discussed below. The Center is now actively interviewing for a Clinical Service Director to work with health centers throughout the US to develop these and other telemedicine programs. The new scale of activities - 59 active facilities - will require new decision-making structures whereby participating facilities can share information, experiences and ideas for program development.

Emergency and trauma services

Physicians and health centers around the State have identified emergency medicine as a practice which would greatly benefit from telemedicine. Adams describes the steps that MCG has already taken:

We put the telemedicine system in our emergency room because we expected to get a lot of requests for emergency consults. We intend to provide 24 hour a day, 7 day a week coverage. Our chief of surgery is very interested in establishing a state-wide trauma network. We have our state set into trauma regions. He wants to link those regions. For example, if there is a horrible car accident in a particular region, the medical control officer there makes the decision on where that patient goes, depending on the information. We will do an electronic network within this network to provide real time advice and assistance.

Procedures have already been established. Adams explains:

The coordinator would call directly into emergency room by phone. The ER staff will be trained on the new system and will answer the call. The physician decides if they can support the request, depending on skills and demands on site. If he can support it, he sets the connection in motion.

Because of the urgency of emergency requests, physicians and other health care providers are being trained to operate the equipment:

Faculty, staff, residents and fellows. We are training them all as part of the job. That way they don't have to wait until the coordinator on call responds to a page.

The service will be available as a last resort to any participating center in the state. However:

Each of our hubs in the statewide expansion will make their own decisions as to whether they can provide 7 day a week or 24 hour coverage. Every site will be responsible for determining what their needs are and where the telemedicine room should be located. We have some sites that say "we get traumas all the time and lots of head injuries and we want it in our ER." Other sites think their emphasis will be more general medicine, and want to put the telemedicine equipment in a room that will provide easy access for in-patients and out-patients.

Clinics

Electronic clinics are an especially effective way to apply telemedicine. They are modeled after real-life clinics. At regularly scheduled times, a specialist is available to provide consultations. Local physicians and their patients arrange to be online during these periods. This approach increases the efficiency with which the consulting physician and local coordinators can use their time.

Experience with this format has been positive, notably in neurology and infectious diseases. Consideration is being given to establishing a clinic to focus on pre-evaluations for cardiac catheterization.

Adams points out that electronic clinics can replace or reduce mobile clinic programs, providing substantial savings.

Because MCG is a state institution, we provide outreach clinics in many specialties - psychiatrists, pediatrics - throughout the state. Sometimes several providers travel to these clinics at a time. They are often on the road for five hours one way. This is completely unproductive. State wide expansion of the telemedicine network can reduce, but never eliminate - as it is important to have one-on-one contact - the amount of travel.

Training for health providers

Conducting electronic conferences is a key strategy for capitalizing on the GSAMS infrastructure. Adams describes the possibilities:

Faculty can present patients and do grand rounds via telemedicine. You are not limited to a telemedicine site that can only hold 10 people. Hospitals and health clinics have been able to bring their physicians and other health care providers into an auditorium to receive this information.

Sanders elaborates this vision:

What we are talking about is education without walls. It's possible that we can extend our educational capabilities to the citizens of Georgia without having to build buildings in every location, without having to hire teachers in every location. I think we have the ability to maximize health sciences education around the state in a way that young people in certain areas can get their education while residing in their communities and using the clinical training in their communities.[12]

Reimbursement

A critical underpinning of the telemedicine program is that the leading health care funders in the state - Medicare, Medicaid, Blue Cross and Blue Shield - reimburse both the attending and consulting physicians for their services. Adams notes,

Blue Cross and Blue Shield are not requiring identification of a consult being done through telemedicine. As they say, "This is not fundamentally different from what we typically see. It's just being done through a telephone line. It's just a different communication means for the provision of health care."

Because Georgia's program has been designed so that no stakeholders suffer, resistance has been minimal. The attending physician is normally present when the consulting physician provides advice and derives both income and educational benefits from the sessions. There are also some programs in place where nurses and PAS present the patients.

However, the reality is that other types of health professionals can contribute greatly to telemedicine consultations. Adams believes it is time to add this flexibility to the reimbursement options while incidentally improving the collection of data:

Medicare/Medicaid come with restrictions which were appropriate when they were instituted. When we first approached Health Care Financing Administration (HCFA) they thought our consultations were fabulous. But they also had some reservations about rural physicians' thoughts and attitudes about a tertiary medical center putting technology into their rural community, and perhaps using physician extenders to eliminate the need for physicians.

Our goal was to use telemedicine to empower physicians to better care for their patients. HCFA put the restriction that they would provide reimbursement only for physician to physician as opposed to physician to nurse, nurse practitioner or social worker or anyone else who would normally receive reimbursement. That was OK with us as we agreed with the restriction and we wanted to avoid any concerns that the rural physician had that we would be serving a different purpose. Now they are paying both physicians - the consulting physician gets reimbursed for their consult, and the attending physician gets reimbursed for an office visit. Medicaid adopted the guidelines and added a facility fee to the rural site where the patient was seen. Blue Cross and Blue Shield reimburses the consulting physician; however they were not requiring any identifier for reimbursement requests. Unfortunately, this method doesn't allow them to track telemedicine reimbursement.

Negotiations are currently under way to enhance flexibility and improve data collection on telemedicine use.

Program evaluation

MCG and the University of Michigan School of Public Health are jointly evaluating the impact of telemedicine on the accessibility, quality and cost of health care in Georgia. Funding for the three year study is provided by the Health Care Financing Administration. The University of Michigan controls the study design, research protocols, data collection and analysis. Project leader Dr. Rashid Bashshur, professor of health services management and policy at the University of Michigan, summarizes the challenge and importance of this research effort:

> *The study is important for several reasons. Its findings should help us ascertain the true merit of telemedicine. The study should also serve as a test bed for learning about telemedicine generally, beyond Georgia's boundaries. For Georgia, it should provide useful information for programmatic adjustments and refinements to improve efficiency, productivity and quality. More generally, the study should answer some critical policy questions such as reimbursement for telemedicine services, and ultimately, whether or not government should support such programs*[13]

Ongoing technical refinements

As part of ongoing program refinement, activities and plans are under way to:

- Automate scheduling of individual appointments
- Develop new switching methods to improve concurrent access to tertiary facilities
- Enhance video quality
- Archive still images

EXPANDING THE BREADTH AND DEPTH OF TELEMEDICINE IN GEORGIA

A number of research and development initiatives promise to substantially enhance Georgia's telemedicine program in the years to come.

Electronic house call

Together with the US Army and the Georgia Institute of Technology, MCG is developing a prototype for delivering telemedicine services to non-mobile people housed in various non-health facilities such as military bases, private residences and nursing homes. The project is funded by MCG, Georgia Research Alliance (GRA) and the US Army.

The proposed home network is designed to electronically bring health care providers into the patient's home environment in order to improve the frequency, quality and cost-effectiveness of assessment and intervention. A desktop system will also be placed in the home and office of the Nursing Home Medical Director.

The initial focus is "on revolving-door patients with chronic conditions such as cardiomyopathy, diabetes, pulmonary diseases and end-stage liver disease - patients who are constantly being re-admitted to the hospital."[14]

The home will be linked to care provided through cable TV technology. Sanders notes:

> *We can take uni-directional cable and a reverse amplifier to it, take it through an Ethernet bridge, and we will have T-1 plus bandwidth into the home, live and interactively. The patient will turn past the home shopping channel to the home medical channel and there will be their physician - or initially, their nurse practitioner - who will be able to see and talk to the patient.*

Non-invasive sensing of vital signs, pulmonary function, heart and lung sounds, electrocardiogram and blood gas analysis will be provided. The prototype - being tested in 25 homes in 1996 - will include video communication/observation, electronic stethoscope, electrocardiogram, doppler, digital blood-pressure cup, pulse oximeter, digital spirometer and a blood chemistry system which "with a single drop of blood" can provide blood glucose, electrolyte hemoglobin and other readings.[15]

Current plans are to build a mechanism which the patient can access from a bed or chair. The user might hold the stethoscope to his chest and click the appropriate icon on the computer screen, thereby sending readings to the doctor while talking to them on the TV monitor.[16] Such equipment needs to be safe and easy to use. The system should also be portable, as one use is to assign the equipment at hospital discharge.

Evaluation will be undertaken of the interface, monitoring and therapeutic protocols, acceptance of equipment within the home and economic implications.

Palpation

A limitation of telemedicine is that the physician is unable to feel or "palpate" the patient. A research effort is under way to solve this problem by electronically providing kinesthetic feedback.

The system will ultimately provide the physician with force and tactile information as if the patient were in the same room with the physician. The initial research is aimed at developing tactile and force sensing capabilities at the patient site and implementing a force feedback and tactile visualization system at the consulting physician site. A robotics manipulator will be used to convey 1) tactile information when in contact with the patient and 2) the amount of force the robot is using to depress the patient's body parts. The robot will be controlled through a position tracking system at the physician site. Force feedback will be provided through a "globe" at the physician site that the physician will wear to palpate the patient. The physician will visualize tactile information in the form of a computer-generated topographical map based on tactile data recorded at the patient site. Eventually, this visualization data will be translated into factual information felt at the fingers and palm. Initial tests will explore anatomical structures exhibiting an abnormality like a cyst or tumor.[17]

This extraordinary enhancement of remote sensing will further deepen and broaden the range of medical practices that can benefit from telemedicine.

Network expansion

Consideration is being given to electronically linking similar institutions. These include:

- A prevention network for nursing homes that allows daily monitoring of this at-risk population
- Networking hospitals which provide specialized children's services. The MCG Children's Medical Center has established a link with the Neonatal Nursery in Phoebe Putney Memorial Hospital in Albany to enable pediatric cardiologists in Augusta to assess babies with heart problems.
- Networking Georgia's public mental health hospitals and community centers for sharing and developing knowledge and skills
- Linking prisons with prison hospitals to improve care and reduce the risk and cost of transporting prisoners

Exporting Georgia's medical knowledge to other parts of the world is also being considered. According to Dr. Sanders, "The physician, at home or at his office, will be able to examine his patients at home or in the hospital, and we will become a major exporter of health care delivery to other nations around the world."

This is not far fetched. Already, health providers such as American Telemedicine International (a subsidiary of the Massachusetts General Hospital in Boston), the Mayo Clinic and Stanford Medical School have conducted trials and even provided services to wealthy clients in the mid-east, Philippines and other regions.[18]

Multimedia information management and education

Although its primary function is to support telemedicine and distance learning, the broadband network can also facilitate other activities. Most notably, interactive multimedia can be deployed to support practitioner decision-making. Reference materials and training applications can use a combination of audio and video clips and lectures, graphical and animated information. Looking into the future, Grigsby notes: "We would love to have interactive presentations. We probably have the best medical illustrations department in the world. We just need the time." The same system and resources can be a learning facility for students, patients and healthy citizens.

Sanders's vision is to connect physicians with patient databases and expert systems.

As a result of the explosive growth in our understanding of the pathophysiology of disease processes, not even the most gifted physician can retain the requisite information. Patient care is thus compromised. We need to adapt the same paradigm shift in information processing for medicine as we have in other fields. As a result of new technology in information storage, retrieval and transmission, we can anticipate striking changes in how a physician evaluates a patient. The future "patient evaluation center" will contain an interactive computer that will take a history using a branched logic tree driven by the patient's response to the previous question.[19]

Soon physicians will have desktop telemedicine systems that are linked with electronic patient records, treatment protocol databases, practice guidelines and other medical information.[20]

ISSUES AND IMPLICATIONS

It is too early to fully assess the experiences of Georgia's telemedicine network. The quality of its medical practice is good, growth has been astonishing, its technical sophistication continues to improve and administrative procedures are in place. Initiatives to incorporate kinesthetic information and expand telemedicine to specialized networks and, ultimately, to the home are now being prototyped.

But usage is low compared with the investment to date. For now, this can be attributed to the novelty of the system. The jury is out until the planned communication and education initiatives are under way.

An important strategic issue relates to the pros and cons of a radical, supply-oriented approach vs. an incremental, demand-driven approach to program development. Taking advantage of available funding, the program jumped from one to six sites and then to a state wide system within four years - far faster than demanded by users. Capacity is likely to be underutilized for some time to come. The benefit is that the marginal cost of delivering services is low. The larger system offers economies of scale for serving existing sites, expanding to other networks and delivering training and decision support to practitioners, patients and citizens.

Within this context, some lessons can be identified about developing and managing telemedicine systems, as presented below.

1. Reward customer use
As the program moves toward use of non-physician local health providers, it will be important that local physicians not feel threatened.

2. Provide ease of use
A determined and successful effort was made to facilitate ease of use for sites, physicians, patients and systems support personnel. Telemedicine is established at sites which already deliver traditional medical services, possess appropriate space and standardized medical equipment and have established effective relationships with regional centers. Patients are welcomed to a comfortable on site room and a similarly colored remote room. Local coordinators assist with set up and camera operation during the consultations, but the equipment is so easy to use that physicians, with little training, can operate the system themselves, as indeed do emergency physicians at MCG. Telephone dial-up enables system maintenance, and the open, modular architecture facilitates ease of upgrade for specific components. Physicians' normal billing and scheduling processes have been incorporated into the administrative procedures. A detailed administrative protocol and centralized support by the Telemedicine Center helps individual sites, coordinators and physicians to anticipate and address any concerns that arise.

3. Encourage use through education, marketing and targeted program development
Usage does not automatically follow from the availability of facilities, or even from general orientation and training.

Intensive and focused communication and education - what the private sector would call marketing - are required from the outset.

To target program and marketing efforts, areas with high potential use should be systematically identified. Initially, program developers did not expect psychiatry and neurology to benefit from the program. It has turned out that telemedicine provides the visual information and patient interaction required by these specialties. Consultations that require in-person observation, high levels of confidentiality or palpation (at least for now) do not fit as well.

Feedback suggests that pre-scheduled clinics are a well received and efficient format for delivering telemedicine.

4. Develop tools for analyzing program impacts
Better tools for assessing the benefits and costs of telemedicine would facilitate health care policy in private and public institutions. For instance:

- Cost-benefit analysis of diagnostic, treatment and preventive telemedicine would help determine the scale and type of investment that should be undertaken by public and private institutions such as managed health care organizations
- Understanding economies of scale and marginal costs would help identify the size of system required to provide cost-effective deployment
- Quantification of the benefits, costs and cash flow associated with telemedicine will help health facilities to assess the financing requirements and the advantages and disadvantages of varying ownership and leasing arrangements for equipment and facilities
- Understanding the regional economic impact of maintaining physicians and health facilities in local communities will help policy makers make funding decisions

5. Apply a continuous learning and knowledge transfer approach

Telemedicine is another instance of the fact that new practices of medicine require continuous learning and adaptation. Meeting demand for better video quality, incorporating more biomedical devices and accommodating the changing needs of each site demand continuous adaptation, learning and dissemination of experiences to others.

As Adams says, "We are learning as we go. So, each site doesn't have to reinvent the wheel."

6. Ensure availability of independent technical expertise that is sensitive to user needs

Site equipment was integrated by a contracted systems integrator based on design specifications provided by MCG. The center has not been pleased with the integrator's performance. Two key lessons have been drawn from this experience.

First, it is essential that the integrator provide a prototype to be thoroughly tested and evaluated by independent biomedical and telecommunication engineers, as well as by providers. All system "bugs" should be resolved prior to implementing new sites. Also, the contract with the integrator should be detailed in delineating responsibilities and accountability.

Second, it is essential to possess the in-house technical capacity to independently evaluate and even adapt vendors' biomedical products. Vendors have typically oversold the capabilities of their products. Off-the-shelf products were supplemented by the customized miniature viewing adapters for a number of the biomedical devices ingeniously developed by MCG technical staff. Third, prototype solutions should be developed and fully tested prior to implementation. Problems that could have been earlier resolved undermine effective operations, preventing product development.

7. Ensure top level support

This program was driven by two prominent persons with a strong commitment to telemedicine - Dr. Tedesco and Dr. Sanders. Without their vision and drive, the program would not have secured its share of the Bell South award or have so rapidly and vigorously developed.

Additional funding was required to support the inevitable difficulties and unexpected costs and delays of start-up. Tedesco reflects on the critical role played by the state government:

> *Quite candidly, this would not have happened without commitment and funding from the State. The technology has existed for years. What made it happen was the fact that the State believed in it, the State said "Let's try it." And then backed that with the appropriate funding and commitment on the part of people. The State department of Administrative Services and Bell South have been key players.*

8. Prepare to deal with licensing and liability issues

Georgia's current system operates within a single state and set of rules for health care delivery and administration. However, telemedicine raises the opportunity and challenge of exporting medical services across state and national borders.

Cross-border delivery of medicine raises thorny licensing, legal and trade issues. For example, what is the liability of a physician who consults to a patient in a state where he does not have a license? Under which state laws would malpractice or financial conflicts be adjudicated? Do interstate trade regulations apply? What about international standards and liabilities?

One approach is to interpret the situation not as transporting the physician to the patient, but rather as transporting the patient to the physician. In this scenario, the laws and practices of the physician's home jurisdiction would apply. An alternative is to establish national certification and rules for providers of telemedicine services.

In Georgia, the consulting MD recommends treatment and the primary care MD writes any treatment orders based on these recommendations. Where treatment orders are written by the consulting physician, procedures will be required for "credentialing" physicians at the hospital where the patient is receiving services.

According to Sanders, "malpractice liability may prove to be one of the most vexing problems and could impede the general application of telemedicine."[21] This partly derives from the perception of potential litigants that large medical centers and funding agencies have deep pockets.

Telemedicine practitioners may be vulnerable to the charge that an intervention is incomplete in some way, i.e., it does not involve a hands-on examination and uses digitally compressed data.

A preventive remedy is for physicians to use telemedicine only when video/audio and remote biomedical telemetry are appropriate. Videotaping will provide documentation of sessions. Patient consent waivers may be required to address legal challenges that emerge.

Georgia has been a pace setter in applying new technologies, and in refining sensitive telemedicine reps among physicians, patients and funding agencies. How Georgia tackles its next set of challenges to expand levels and scope of use will have important implications for the practice of health in all jurisdictions.

– Michael Miloff

Notes:

1 Presentation materials provided to the Alliance by the Telemedicine Center

2 Telemedicine: Bringing Medical Care to Isolated Communities," J. Sanders, F. Tedesco, *Journal of the Medical Association of Georgia*, May 1993.

3 Ibid.

4 Ibid.

5 "Training Physicians to use Telemedicine, Extract Report," Bell South Telemedicine Training Grant

6 "Telemedicine: Is there a Doctor on this Channel," *Healthscope*, Spring 1995.

7 "New Technology Fits in Fast," Toni Baker, *The Telemedicine Connection*, Vol 1, Number 1, Winter 1995.

8 "Telemedicine Expands," *Medical College of Georgia Today, Annual Report*, Volume 23, Number 1, Fall 1994, 4

9 "New Technology Fits in Fast," Toni Baker, *The Telemedicine Connection*,Vol. 1, Number 1,Winter 1995.

10 "Telemedicine Patient Log provided by Telemedicine Center.

11 If individual telephone calls are charged on a marginal basis, then the fixed costs would drop and the marginal cost would increase to approximately $55 per call for the first 1,620 calls per year.

12 "Telemedicine Expands" in *Medical College of Georgia Today, Annual Report*,Volume 23, Number 1, Fall 1994, 7

13 "Medical College of Georgia Telemedicine Center the Focus of Federal Study of Effects of Telemedicine," Kaye Shirah, *The Telemedicine Connection*, Vol 1, Number 1, Winter 1995.

14 Dr. J. Sanders quoted in "Telepresence: Changing the Focus of Medicine," *US Medicine*,Volume 31, Nos 9 and 10, May 1995, 8.

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19 "Medicine must accept paradigm shift in information processing," *Telemedicine*, Miller Freeman Inc., 1993.

20 Telemedicine - Is there a Doctor on this Channel," K. Grigsby, L. Adams and J. Sanders, *Healthscope*, Spring 1995, 18.

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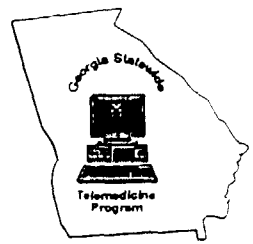
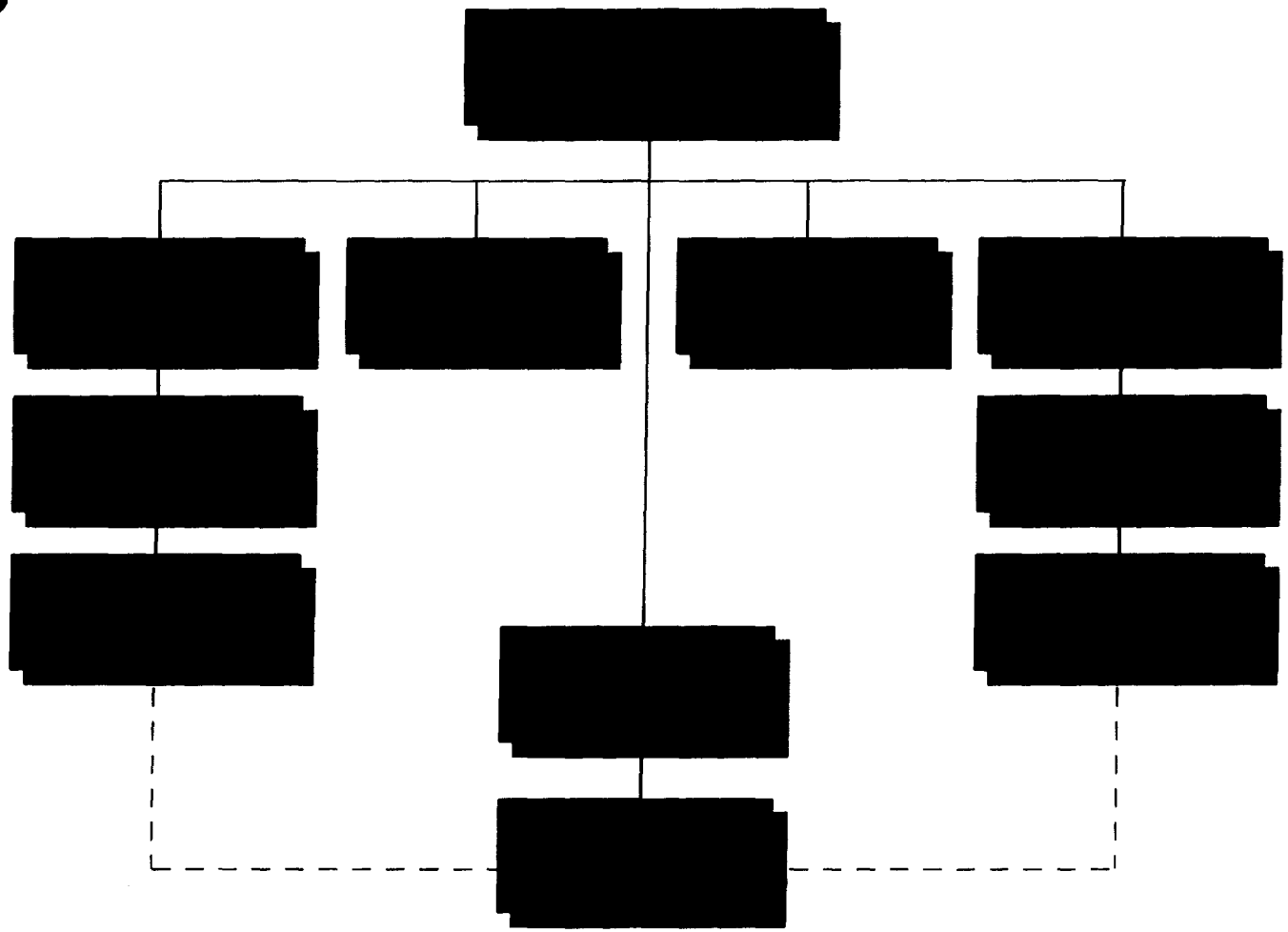
Operational Aspects of Telemedicine



Georgia Statewide Telemedicine Program

Oversight Structure



GSTP Update - Funding Sources

- SB144
- Medical College of Georgia
  - → State Office of Rural Health
  - → Georgia Research Alliance
  - → Internal Funds

GSTP Update - Development Funds

- SB144 ($9,642,000)
  - → $8 million
  - → $1 million TSPP
  - → $92,000 Microscopes
  - → $200,000 Redeployment
  - → $350,000 Patient Data Management System

GSTP Update - Development/Support Funds

- Medical College of Georgia
  - → $3.2 million

GSAMS

Georgia Statewide Telemedicine Program

Distance Learning Program